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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/782,746

02/19/2004

Andrew J. Peltoma

17310-296454

1661

25764 7590 12/22/2006

FAEGRE & BENSON LLP

PATENT DOCKETING

2200 WELLS FARGO CENTER

90 SOUTH SEVENTH STREET

MINNEAPOLIS, MN 55402-3901

EXAMINER

VAN, LUAN V

ART UNIT

PAPER NUMBER

1753

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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3 MONTHS

12/22/2006

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No. 10/782,746	Applicant(s) PELTOMA ET AL.	
	Examiner Luan V. Van	Art Unit 1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 October 2006.
 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 and 9-13 is/are pending in the application.
 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
 5) ☐ Claim(s) _____ is/are allowed.
 6) ☒ Claim(s) 1-7 and 9-13 is/are rejected.
 7) ☐ Claim(s) _____ is/are objected to.
 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on October 10, 2006 has been entered.

Response to Amendment

Applicant's amendment of October 10, 2006 does not render the application allowable.

The amendment is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: Claims 1-7 and 9-13 are amended to recite the limitations of "to fill the aperture in the insulating layer with the first conductive material... to a height about equal to or greater than the surface of the conductive lead layer". The amended claim as currently written suggests that the electroplated the first conductive material over the aperture has a height equal to or greater than the surface of the conductive lead layer. However, there is no evidence in the applicant's disclosure

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to support the amended limitations. Fig. 6 of the instant specification shows that the electroplated first conductive material in the aperture is below the surface of the conductive lead layer. Therefore, the disclosure does not provide a clear indication to support the amended limitations. Applicant is required to cancel the new matter in the reply to this Office Action.

Status of Objections and Rejections

All rejections from the previous office action are withdrawn.

New grounds of rejection under 35 U.S.C. 103(a) are necessitated by the amendments.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-7 and 9-13 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claims 1-7 and 9-13 are amended to recite the limitations of "to fill the aperture in the insulating layer with the first conductive material... to a height about equal to or

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greater than the surface of the conductive lead layer". The amended claim as currently written suggests that the electroplated first conductive material over the aperture has a height equal to or greater than the surface of the conductive lead layer. However, there is no evidence in the applicant's disclosure to support the amended limitations. Fig. 6 of the instant specification shows that the electroplated first conductive material in the aperture is below the surface of the conductive lead layer. Therefore, the disclosure does not provide a clear indication to support the amended limitations.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1, 6, 7 and 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cowles et al. in view of Rinne et al.

Regarding claims 1, 7, 10 and 11, Cowles et al. teach a method for forming an electrical interconnect on an integrated lead suspension of the type having a spring metal layer (stainless steel layer 302, figure 2), a conductive lead layer 306 (figure 2) and an insulating layer 304 (figure 2) separating portions of the spring metal and conductive lead layers, including: forming an aperture 300 (figure 2) through at least the insulating layer and the conductive lead layer; and filling the vias with plated solder or screen solder to connect a stainless steel layer to the copper layer (column 3 lines 63-67). The solder is applied through a mask as indicated in figure 2 and removing the mask after solder 308 is formed. Further, Cowles et al. teach "the same can be done from the stainless steel to the copper layer. Instead of opening the via from copper layer to stainless steel layer, the via is open from the stainless steel layer to the surface of the copper layer through the dielectric layer" (column 2 lines 37-41). Plated solder is an electroplated solder.

Cowles et al. differ from the instant claims in that the reference does not explicitly teach filling the aperture to the height of the instant claim, although Cowles et al. teach the conductive material (i.e., solder 310) is plated, i.e. electroplated, over the spring metal layer to a height about greater than the surface of the conductive lead layer as seen on the edges (see Fig. 2).

Nevertheless, Rinne et al. teach electroplating an aperture or via in the insulating layer with a conductive material to the same thickness as the top surface layer (see Fig. 1F). It will have been obvious to one having ordinary skill in the art to have

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electroplated the conductive material to a height equal to the surface of the conductive lead layer, because it would form a reliable interconnect.

With respect to filling the aperture in the insulating layer, Cowles et al. teach partial filling of the aperture with plated solder as shown in Fig. 2. The claim language is open to partial filling of the aperture, thus the teaching of Cowles et al. reads on the instant limitation. Further, Cowles et al. teach completely filling the aperture with screen solder 312. It would have been obvious to one having ordinary skill to have the electroplated the solder to a height equal to or greater than the conductive lead layer as suggested by Cowles et al., because it would be suitable for forming an interconnection as taught by Cowles et al. Nevertheless, Rinne et al. teach complete filling of an aperture by electroplating (see Fig. 1F). It will have been obvious to one having ordinary skill in the art to have completely filled the aperture as taught by Rinne et al., because it would form a reliable interconnection.

Regarding claim 6, Cowles et al. differ from the instant claims in that the reference does not explicitly teach that the plated conductive material is not in contact with the conductive lead layer. However, Cowles et al. teach that solder is plated to connect the spring metal layer (i.e., stainless steel layer) to the conductive lead layer (i.e., copper layer). This creates a ground path from the copper layer to the stainless steel layer (column 3 lines 65-67). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Cowles et al. by forming a conductive material which is not in contact with the conductive lead layer if the ground path between the copper layer and the stainless

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steel layer is not desired. By omitting the ground path, the two layers would be electrically isolated from each other.

Regarding claim 9, Cowles et al. teach a via is opened in the ILS from the copper layer to the polyimide layer to the stainless steel layer or alternatively from the stainless steel layer to the polyimide layer to the copper layer (column 3 lines 59-62). This teaching reads on the instant claim.

Claims 2-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cowles et al. in view of Rinne et al., and further in view of Shangguan et al.

Cowles et al. and Rinne et al. teach the method as described above.

Cowles et al. differ from the instant claims in that the reference does not explicitly teach a second conductive material, i.e. gold, on the interconnect (claims 2-4); or forming a nickel layer (claim 5).

Shangguan et al. teach a method to form an interconnection between integrated circuit boards and integrated circuits. The method involves metallization of the bond pad and multiple, novel bump compositions and coating compositions to provide an interconnection which is reliable and which withstands differences in the coefficient of thermal expansion between the silicon device in the bump material (Abstract). The metalization is formed by electroplating copper over the interconnect (column 3 lines 51-56). This method is advantageous over conventional solder bumps, because it "is inexpensive, consumes a minimal amount of space, and does not require the use of wire bonding" (column 2 lines 59-63). In addition, Shangguan et al. teach depositing a

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nickel layer to prevent the diffusion of copper (column 4 lines 15-19), and depositing a gold layer "to provide corrosion protection for the bump during the service of the module" (column 4 lines 59-61).

Addressing claims 2-4, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Cowles et al. by electroplating the second conductive material, such as gold, of Shangguan et al., because electroplating a gold film would provide a corrosion barrier for the interconnect.

Addressing claim 5, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Cowles et al. by forming the nickel film of Shangguan et al., because it would provide a diffusion barrier between the underlying conductive substrate and the copper layer.

Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cowles et al. in view of Rinne et al., and further in view of Gay et al.

Cowles et al. teach the method as described above in addressing claim(s) 1.

The difference between the reference to Cowles et al. and the instant claims is that the reference does not explicitly teach removing oxide from the substrate before electroplating.

Gay et al. teach a method for anodic cleaning of a stainless steel substrate in order to improve to adhesion between the plated layer and the stainless steel (column 1 lines 37-43).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Cowles et al. and Rinne et al. by removing oxide from the substrate before electroplating as taught by Gay et al., because it would improve to adhesion of the plated layer and the stainless steel.

Response to Arguments

In the arguments presented on page 9 of the amendment, the applicant argues that Cowles et al. do not teach plated interconnects; instead, they disclose soldered interconnects. This argument is deemed to be unpersuasive, because Cowles et al. teach plating interconnect 300 with solder. Plated solder is formed by electroplating solder, and solder is a conductive material; thus the teachings of Cowles et al. read on claim 1. With respect to the height of the conductive material, Cowles et al. teach the conductive material (i.e., solder 310) is electroplated over the spring metal layer to a height about greater than the surface of the conductive lead layer as seen on the edges (see Fig. 2). Nevertheless, Rinne et al. teach electroplating an aperture or via in the insulating layer with a conductive material to the same thickness as the top surface layer (see Fig. 1F). It will have been obvious to one having ordinary skill in the art to have electroplated the conductive material to a height equal to the surface of the conductive lead layer, because it would form a reliable interconnect.

Conclusion

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The prior art made of record and not relied upon is considered pertinent to the applicant's disclosure. US patents 4855871 and 6647621 are hereby made of record.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luan V. Van whose telephone number is 571-272-8521.

The examiner can normally be reached on M-F 9:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

LVV
December 15, 2006



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